Environmental Science

RESPONSE OF MICROBIAL POPULATIONS TO LEAD CONTAMINATION FROM DIFFERENT SOURCES

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Soil in many areas of Missouri is contaminated with lead from both smelter and lead mining activity. The chemical forms of lead present in the environment are thought to vary depending on the lead source. Smelter waste is generally considered to be more bioavailable and therefore more hazardous to living organisms than mining waste. The responses of soil bacterial populations to contaminants may be used as a sensor for the toxicity and bioavailability of that pollutant. It has been proposed that monitoring changes in bacterial populations during contaminant removal could also be a valuable tool in assessing the success of the treatment method.

The objective of this research is to examine the responses of bacterial populations to lead contamination in soil that originates from different sources, as well as soil that is being chemically treated in an effort to limit the bioavailability of lead. Soil samples were obtained from a smelting facility, mining areas, residential yards contaminated with smelter waste, and experimental plots being treated with phosphoric acid.

Initial studies indicate that bacterial numbers diminish when lead contamination is present. All contaminated samples showed a 10-fold decrease in total colony forming units per gram of soil (CFUG) when compared to controls. Treatment methods that immobilize lead resulted in an increase in bacterial numbers. Contaminated residential soil that was undergoing treatment with 1% phosphoric acid had $1.54 * 10^6$ CFUG, whereas the untreated sample contained only $6.45 * 10^5$ CFUG. It appears that lead contamination of mining origin is more detrimental to bacterial populations than that of smelting origin. Studies show $7.6 * 10^5$ CFUG are present in mining waste contaminated soil and $1.0 * 10^7$ are present in soil near a lead smelter. Additionally, the types of bacteria present differ at each contaminated site. The smelter-contaminated site contained predominantly *Variovorax* sp., whereas the mining waste site is enriched with *Pseudomonas* sp. Overall, the diversity of bacterial populations is diminished in smelter contaminated soil, and the Biolog^{tm} Ecoplate system is being used to assess diversity in all samples.